

**UNITED STATES PATENT APPLICATION**

**OF**

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**FOR**

**METHOD AND APPARATUS FOR PREPARING A SLURRY OF  
ADD-ON MATERIAL TO BE APPLIED TO A WEB**

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**METHOD AND APPARATUS FOR PREPARING A SLURRY OF ADD-ON MATERIAL TO BE APPLIED TO A WEB**

**FIELD OF THE INVENTION**

**[0001]** The present invention relates to a method and apparatus for preparing a slurry of add-on material to be applied in a predetermined pattern on a base web, preferably in the form of bands, and more particularly, to a method and apparatus for producing cigarette paper having banded regions of the additional material.

**BACKGROUND OF THE INVENTION**

**[0002]** In commonly assigned U.S. Patent No. 5,534,114, which is incorporated herein by reference in its entirety, an embodiment of a moving orifice applicator is disclosed that is used to produce webs of cigarette paper having patterns of add-on material. The moving orifice applicator includes an elongated cavity block or chamber and a perforated endless belt whose lower traverse passes along the bottom portion of the chamber. The chamber is positioned obliquely across a web-forming device (such as a Fourdrinier wire). A base web is formed on the Fourdrinier wire from a slurry of material. In operation of the moving orifice applicator, a slurry of add-on material is continuously supplied to the chamber as the endless belt is looped through the bottom portion of the chamber such that plural streams of material are generated from beneath the chamber to impinge the base web passing beneath the chamber. As a result, bands of the add-on material are applied repetitively to the base web. The orientation, width, thickness and spacing of the bands are all determinable by the relative speed and orientation of the endless belt to the moving web.

**[0003]** When using the applicator and constructing banded cigarette papers, the add-on material is usually a form of fibrous cellulose. The fibrous cellulose can be derived from the straw of a flax plant that remains after the seeds of the flax plant

have been harvested for the production of linseed oil, or from other materials including but not limited to wood pulp. The flax straw must be processed in order to produce a slurry of the add-on material. Other patents discussing methods and apparatus for producing cigarette paper having banded regions of add-on material include commonly assigned U.S. Patent Nos. 5,997,691 and 5,332,472, which are also incorporated herein by reference in their entireties.

#### SUMMARY

**[0004]** A method according to an embodiment of the invention includes the steps of cooking a fibrous cellulosic material, bleaching the material, pressing the cooked and bleached material to remove liquid, drying the pressed material, and milling the dried material to produce fibers of a desired size. After the fibers of a desired size have been produced during the milling operation, the resulting material is blended with water to hydrate the material and produce a slurry of add-on material that can then be applied in a pattern to a base web of cigarette paper such that the regions of the cigarette paper having the add-on material have a lower porosity and accordingly a slower burn rate than the regions of the cigarette paper that do not have the applied add-on material.

**[0005]** Other aspects of a method according to an embodiment of the invention for processing feedstock to produce a fibrous cellulosic material having a narrow range of fiber size distribution can include subjecting the feedstock to a hammering process for removal of non-fibrous components from the feedstock before cooking of the feedstock and additional steps are performed to produce the slurry of add-on material.

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0006] Fig. 1 is a perspective view of a paper-making machine for producing paper constructed in accordance with the methodologies of the present invention.

[0007] Fig. 2 is a perspective view of a cigarette constructed with paper produced in accordance with the methodologies of the present invention.

[0008] Fig. 3 is a schematic diagram of a moving orifice applicator system together with a representation of a method for preparing the pulp slurry used for the base web and additional refining steps performed to produce add-on material.

[0009] Fig. 4 is a schematic diagram of a method for producing a slurry of add-on material wherein multi-disk refining of a wet slurry is bypassed and replaced with pressing, drying, grinding and then mixing to produce the slurry of add-on material according to an embodiment of the invention.

#### DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0010] Referring to Fig. 1, an embodiment of a cigarette paper-making machine 2 is shown, such as is described in more detail in commonly assigned U.S. Patent No. 5,997,691, and which can apply a pattern of add-on material across the base width of cigarette paper. The methodologies of the present invention used in producing the add-on material result in add-on material having a very narrow range of cellulose fiber sizes, and as a result the areas of the cigarette paper having the add-on material provide consistent and predictable performance. The add-on material is produced in much shorter time and with consumption of less energy than would be required to produce similar add-on material having a comparably narrow range of fiber sizes using techniques wherein a wet slurry material is repeatedly refined using multi-disk refiners.

[0011] In a method according to an embodiment of the invention the add-on material to be applied in a pattern to a base web of cigarette paper is produced by cooking a fibrous cellulosic material, bleaching the material, pressing the cooked and bleached material to remove liquid, drying the pressed material, milling or grinding the dried material to produce fibers of a desired size and mixing the resulting material with water to obtain the slurry of add-on material. Preferably, the milling step is configured to achieve a weighted average fiber length of approximately 0.5 to 1 mm, or more preferably approximately 1 mm. The milling or grinding step enables the production of a consistent fiber size with a very narrow range of fiber size distribution. Milling of the dry material also consumes considerably less energy than a multi-disk refining operation performed on a wet slurry of the fibrous cellulosic material.

[0012] As shown in Fig. 1, the cigarette making machine 2 includes a headbox operatively located at one end of a Fourdrinier wire 6, a source of feedstock slurry such as a run tank 8 in communication with the headbox 4, and a moving orifice applicator 10 in operative communication with another source of slurry such as a day tank 12.

[0013] The headbox 4 can be one typically utilized in the paper making industry for laying down cellulosic pulp upon the Fourdrinier wire 6. Preferably, the feedstock from the run tank 8 is a refined, cellulosic pulp such as a refined flax or wood pulp as is the common practice in the cigarette paper making industry.

[0014] The moving orifice applicator 10 preferably comprises an elongate chamber box 30 for establishing a reservoir for add-on slurry in an oblique relation across the path of the Fourdrinier wire 6. The moving orifice applicator also includes an endless perforated steel belt 32, whose pathway is directed about a drive wheel 34, a guide wheel at the apex of the moving orifice applicator 10 and a follower wheel 38 at the opposite end of the chamber box 30 from the drive

wheel 34. The endless belt 32 is directed through a bottom portion of the chamber box 30 and subsequently through a cleaning box as it exits the chamber box 30, moves toward the drive wheel 34 and continues along the remainder of its circumlocution.

**[0015]** As each perforation or orifice of the belt 32 passes through the bottom portion of the chamber box 30, the orifice is communicated with the reservoir of slurry established in the chamber box 30. At such time, a stream 40 of slurry discharges from the orifice as the orifice traverses the length of the chamber box 30. The discharge stream 40 impinges upon the base web 22 passing beneath the moving orifice 10 so as to create a band of add-on material upon the base web 22. The bands of add-on material on the base web have fibers that are of a shorter length than the fibers in the base web as a result of the processes performed on the add-on material. In accordance with an embodiment of the invention, the fibrous cellulosic material that is processed to produce the bands of add-on material undergoes at least cooking and bleaching, followed by pressing to remove moisture, drying, grinding or milling to produce the fibers of shorter length than the fibers in the slurry used for the base web, followed by mixing with water to produce the slurry of add-on material. The bands of add-on material therefore create designated regions of lower porosity on the base web such that the burn rate of the resultant cigarette paper changes in the regions having the add-on material. Referring now also to Fig. 2, the cigarette paper is wrapped about a column of tobacco to form the tobacco rod of a cigarette 7, which will exhibit a slower burn rate in the banded regions 5 in comparison to the regions of the base sheet 3 between the banded regions 5.

**[0016]** Referring to Fig. 3, the preparation of the slurry for production of the cigarette paper using the moving orifice applicator 10 initiates with the cooking of flax straw feedstock 190, preferably using the standard Kraft process 200 that

prevails in the paper making industry. In a method according to an embodiment of the present invention, as shown in Fig. 4, the flax straw that is subjected to the cooking process can be first passed through a hammer mill 120 or other similar device or process in order to remove as much of the non-fibrous material, commonly referred to as shive, as possible from the flax feedstock, as well as reducing the fiber length of the flax feedstock.

**[0017]** After the flax feedstock has been processed in a hammer mill, it is then cooked using the standard Kraft process, and subjected to a bleaching step 122. After bleaching, the feedstock is then passed to a pressing machine where water or other liquids are removed 124. The pressed material is then dried and the dried material is then passed to a milling or grinding machine where the dried material is milled or ground 126 to produce fibers of a desired size. Preferably, the milling step is configured to achieve a weighted average fiber length of approximately 0.5 to 1 mm, or more preferably approximately 1 mm. The milling step can be controlled such that the resultant fiber size falls within a very narrow range of fiber sizes. The milling of the dried feedstock also enables the production of the flax feedstock having a very narrow range of fiber size distribution in a period of time that is shorter and consumes less energy than would be required if the fibrous material were suspended in a liquid solution and processed using multi-disk refiners operating on a wet slurry in order to arrive at a similarly narrow range of fiber size distribution.

**[0018]** After the milling of the dried material produces the fibers of a desired size, the milled feedstock is then blended with water in a step 128 to hydrate the feedstock and produce a slurry. The slurry can then be passed into a day tank 12 from which it is supplied to the moving orifice applicator 10, which generates the pattern of add-on material on the base web. If desired, the slurry resulting from hydration of the milled feed stock can be subjected to a further refining step 130

in a double-disk refiner as a final touch-up before being provided to the day tank 12.

**[0019]** While the invention has been described in detail with reference to specific embodiments thereof, it will be apparent to those skilled in the art that various changes and modifications can be made, and equivalents employed, without departing from the scope of the appended claims.